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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/825,297	04/16/2004	Jae-ho You	Q81009	7767

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EXAMINER	
CROW, ROBERT THOMAS	

ART UNIT	PAPER NUMBER
1634	

DATE MAILED: 09/29/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/825,297	YOU ET AL.	
	Examiner	Art Unit	
	Robert T. Crow	1634	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *16 April 2004* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *10825297*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Information Disclosure Statement

The Information Disclosure Statement filed 22 August 2005 is acknowledged. However, the Office Action from the Korean Intellection Property Office will not be entered because there is no publication date. See 37 CFR 1.98. In addition, document number US 2002/0124565 is not being considered because the inventor listed on the document is Tsuji, not Cunningham et al as listed on the Information Disclosure Statement.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 22-23 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 22-23 are indefinite in claim 22, which recites the limitation "a fluorescent dye labeled to a target DNA" in line 13 of claim 22. The chip of claim 22 does not describe any probe or other structure for attaching the target DNA to the chip; therefore, it is unclear what relationship the target DNA has with the chip.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

2. Claims 1-3, 7-16, and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tiefenthaler et al (U.S. Patent No. 4,815,843, issued 28 March 1989) in view of Gourley (U.S. Patent No. 5,793,485, issued 11 August 1998).

Regarding claim 1, Tiefenthaler et al teach a DNA chip comprising:

a substrate (e.g., substrate 2 of Figure 5, column 3, lines 30-35);

a high reflection region comprising a first film having a relatively high refractive index on a region of the substrate (e.g., Figure 5, where layer 1 has a higher refractive index than the adjacent media; [column 3, lines 47-47], and wherein layer 1 is on diffraction grating 4, which is reflective; column 4, lines 8-12);

a low reflection region having a second film of a relatively low refractive index positioned around the high reflection region on the substrate (e.g., protective layer 12 of Figure 5, which surrounds the grating region and is a SiO2 layer; column 8, lines 55-58); and

a DNA probe fixed on the high reflection region (e.g., nucleic acid are immobilized on layer 1 to form the additional layer 5 of Figure 5; column 4, line 57-column 5, line 2).

Tiefenthaler et al do not explicitly teach that the low reflection region has a lower reflectance than the higher reflection region. It is noted that *In re Best* (195 USPQ 430) and *In re Fitzgerald* (205 USPQ 594) discuss the support of rejections wherein the prior art discloses subject matter which there is reason to

believe inherently includes functions that are newly cited or is identical to a product instantly claimed. In such a situation the burden is shifted to the applicants to "prove that subject matter shown to be in the prior art does not posses characteristic relied on" (205 USPQ 594, second column, first full paragraph). Because Tiefenthaler et al teach specific film materials required in dependent claims 7-8 (e.g., a high refractive index film of titanium dioxide [column 3, lines 34-39], and a low refractive index film of silicon oxide [i.e., SiO2; column 8, lines 55-58], it is believed Tiefenthaler et al teach materials having the required reflective properties of instant claim 1.

In addition, while Tiefenthaler et al teach that the high reflection region comprises two or more layers stacked on top of each other (column 3, lines 34-39), and that the layers are the high refractive index film titanium dioxide or the low refractive index film silicon dioxide (column 3, lines 34-39), Tiefenthaler et al do not explicitly teach a layer of the low refractive index material stacked on a high refractive index film, nor do Tiefenthaler et al teach the high reflection regions has a higher reflectivity than the substrate.

However, Gourley teaches a biochip (e.g., a resonant-cavity apparatus for cytometry analysis; Title) comprising

a substrate (e.g., substrate 50 of Figure 3a [column 12, lines 1-2], which is a silicon; column 12, lines 12-20); column having a high reflection region (e.g., an analysis region comprising reflecting mirror 14 and gain medium 18, wherein part#52 is an activated portion of gain medium 18; Figure 3a and column 12, lines 20-45) comprising a first film of having a relatively low refractive index and a film having a relatively high refractive index stacked on a region of the substrate (e.g., the mirror and is formed from a plurality of alternating layers of high and low refractive index materials [column 12, lines 20-45], and wherein the gain medium is the high refractive index film) with the added advantages that the layered films provide reflectivity to 99% or more and that the silicon substrate is micromachineable (column 12, lines 15-31).

While Gourley does not explicitly teach the high reflection region has a higher reflectance than the substrate, it is noted above that the burden is shifted to the applicants to "prove that subject matter shown to be in the prior art does not posses characteristic relied on" (205 USPQ 594, second column, first full paragraph) when the prior art discloses subject matter which there is reason to believe inherently includes functions that are newly cited or is identical to a product instantly claimed. Because Gourley teaches a specific substrate material required in dependent claim 9 (e.g., a silicon substrate; column 12, lines 12-20) having a high reflection region on said substrate (i.e., the reflective mirror; column 12, lines 20-25), and because Tiefenthaler et al teach the it is believed Gourley teaches the specific materials having the required reflective properties of dependent claims 7-9, it is believed that the modification of the device of Tiefenthaler et al with the substrate and layers of high- and low-refractive index materials of Gourley has the required reflective properties of instant claim 1.

It would therefore have been obvious to a person of ordinary skill in the art at the time the invention was made to have modified the DNA chip as taught by Tiefenthaler et al with the layered high reflection region of Gourley with a reasonable expectation of success. The ordinary artisan would have been motivated to make such a modification because said modification would have resulted in a high reflection region providing reflectivity to 99% or more on a micromachineable support as explicitly taught by Gourley (column 12, lines 15-31).

Regarding claim 2, the chip of claim 1 is discussed above. Gourley also teaches the high reflection region is configures such that the first low refractive index film and the high refractive film are stacked alternately on the substrate (e.g., the mirror is formed from a plurality of alternating layers of high and low refractive index materials; column 12, lines 20-25).

Regarding claim 3, the chip of claim 1 is discussed above. Tiefenthaler et al also teach the low reflection regions is configured such that the second low refractive index film is stacked on the substrate (e.g., Figure 5, wherein layer 12 is stacked on top of the layers on the substrate).

Regarding claim 7, the chip of claim 1 is discussed above. Tiefenthaler et al also teach the high refractive index film is titanium dioxide (column 3, lines 34-39).

Regarding claim 8, the chip of claim 1 is discussed above. Tiefenthaler et al also teach the second low refractive index film is silicon oxide (e.g., protective layer 12 of Figure 5, which surrounds the grating region is a SiO2 layer; column 8, lines 55-58).

Regarding claim 9, the chip of claim 1 is discussed above. Tiefenthaler et al also teach the substrate is glass (column 3, lines 32-33).

Regarding claims 10-11, the chip of claim 1 is discussed above. Gourley also teaches a coating film formed on the surfaces of the high reflection region and the low reflection region, and wherein the coating film is formed of an amine radical (e.g., Figure 6, wherein membrane 15 covers protective layer 12 and the high reflection region comprising the portions of layers 5 and 1 and diffraction grating 4 [column 8, line 66-column 9, line 5], and wherein the membrane is covered by an additional layer 5 comprising receptor molecules [column 9, lines 15-19], wherein the receptor molecules are nucleic acids, which have amine radicals; column 4, line 57-column 5, line 2).

Regarding claim 12, the chip of claim 1 is discussed above. Gourley also teaches a plurality of high reflection regions in an array (e.g., Gourley teaches a plurality of analysis regions; column 2, lines 50-58).

Regarding claim 13, the chip of claim 1 is discussed above. Gourley also teaches in said high reflection region said first film having a relatively low refractive index is positioned between said substrate and said film having a relatively high refractive index (e.g., the mirror is formed from a plurality of alternating layers of high and low refractive index materials; column 12, lines 20-25 and Figure 3a, wherein more than two alternating layers are shown).

Regarding claim 14, the chip of claim 1 is discussed above. Gourley also teaches said high reflection region comprises a plurality of said first films having a relatively low refractive index and a plurality of said films having a relatively high refractive index, and wherein said plurality of said high

refractive index films and said first low refractive index films are stacked alternatively on said substrate (e.g., the mirror is formed from a plurality of alternating layers of high and low refractive index materials; column 12, lines 20-25 and Figure 3a, wherein more than two alternating layers are shown).

Regarding claim 15, the chip of claim 1 is discussed above. Gourley also teaches the low reflection region comprises a plurality of thin films (e.g., Figure 3b, wherein #60 is an upper electrode of indium tin oxide [column 14, lines 15-18]; indium tin oxide has a refractive index of 1.8, which is lower that TiO2).

Regarding claim 16, the chip of claim 1 is discussed above. Claim 16 requires at least a portion of said second film in said low reflection region is part of said first film in said high reflection region.

Tiefenthaler et al teach the high reflection region comprises alternating layers of TiO2 and SiO2 stacked on top of one another (column 3, lines 34-39). Thus, an arrangement of layers wherein the SiO2 layer is the top layer would be an obvious rearrangement of the layers taught by Tiefenthaler et al. The courts have held that the rearrangement of parts within a device is obvious when the arrangement does not specifically modify the operation of the device (*In re Japikse*, 181 F.2d 1019, 86 USPQ 70 (CCPA 1950)). See MPEP §2144.04.

Tiefenthaler et al also teach the low reflection region having a second film of a relatively low refractive index positioned around the high reflection region on the substrate is SiO2 (e.g., protective layer 12 of Figure 5, which surrounds the grating region and is a SiO2 layer; column 8, lines 55-58).

Therefore, the rearrangement of the TiO2 and SiO2 layers of the high reflection region wherein SiO2 is the top layer followed by the stacking of the low reflection on top of the high reflection region (e.g., Figure 5) would result in the two regions of SiO2 coming into contact with each other.

It is noted that *In re Best* (195 USPQ 430) and *In re Fitzgerald* (205 USPQ 594) discuss the support of rejections wherein the prior art discloses subject matter which there is reason to believe inherently includes functions that are newly cited or is identical to a product instantly claimed. In such a situation the burden is shifted to the applicants to "prove that subject matter shown to be in the prior art does not

posses characteristic relied on" (205 USPQ 594, second column, first full paragraph). Thus, by virtue of the polymeric nature of SiO2, at least a portion of the upper layer of SiO2 would be part of the lower layer of SiO2, and obvious rearrangement of the layers of Tiefenthaler et al therefore meets the limitations of claim 16.

Regarding claim 19, Tiefenthaler et al teach a DNA chip comprising

a substrate (e.g., substrate 2 of Figure 5, column 3, lines 30-35);

a high reflection region comprising a first film having a relatively high refractive index on a region of the substrate (e.g., Figure 5, where layer 1 has a higher refractive index than the adjacent media; [column 3, lines 47-47], and wherein layer 1 is on diffraction grating 4, which is reflective; column 4, lines 8-12);

a low reflection region having a second film of a relatively low refractive index which surrounds the high reflection region on the substrate (e.g., protective layer 12 of Figure 5, which surrounds the grating region and is a SiO2 layer; column 8, lines 55-58).

Tiefenthaler et al do not explicitly teach that the low reflection region has a lower reflectance than the higher reflection region. It is noted that *In re Best* (195 USPQ 430) and *In re Fitzgerald* (205 USPQ 594) discuss the support of rejections wherein the prior art discloses subject matter which there is reason to believe inherently includes functions that are newly cited or is identical to a product instantly claimed. In such a situation the burden is shifted to the applicants to "prove that subject matter shown to be in the prior art does not posses characteristic relied on" (205 USPQ 594, second column, first full paragraph). Because Tiefenthaler et al teach specific film materials required in dependent claims 7-8 (e.g., a high refractive index film of titanium dioxide [column 3, lines 34-39], and a low refractive index film of silicon oxide [i.e., SiO2; column 8, lines 55-58], it is believed Tiefenthaler et al teach materials having the required reflective properties of instant claim 19.

In addition, while Tiefenthaler et al teach that the high reflection region comprises two or more layers stacked on top of each other (column 3, lines 34-39), and that the layers are the high refractive

index film titanium dioxide or the low refractive index film silicon dioxide (column 3, lines 34-39), Tiefenthaler et al do not explicitly teach a plurality of the low refractive index material stacked on a high refractive index film nor do Tiefenthaler et al teach the high reflection regions has a higher reflectivity than the substrate.

However, Gourley teaches a biochip (e.g., a resonant-cavity apparatus for cytometry analysis; Title) comprising

a substrate (e.g., substrate 50 of Figure 3a [column 12, lines 1-2], which is a silicon; column 12, lines 12-20); column having a high reflection region (e.g., an analysis region comprising reflecting mirror 14 and gain medium 18, wherein part#52 is an activated portion of gain medium 18; Figure 3a and column 12, line 4) comprising a plurality of first films having a relatively low refractive index and a plurality of films having a relatively high refractive index, and wherein said plurality of said high refractive index films and said first low refractive index films are stacked alternatively on said substrate (e.g., the mirror is formed from a plurality of alternating layers of high and low refractive index materials; column 12, lines 20-25 and Figure 3a, wherein more than two alternating layers are shown); and with the added advantages that the layered films provide reflectivity to 99% or more and that the silicon substrate is micromachineable (column 12, lines 15-31).

While Gourley does not explicitly teach the high reflection region has a higher reflectance than the substrate, it is noted above that the burden is shifted to the applicants to "prove that subject matter shown to be in the prior art does not posses characteristic relied on" (205 USPQ 594, second column, first full paragraph) when the prior art discloses subject matter which there is reason to believe inherently includes functions that are newly cited or is identical to a product instantly claimed. Because Gourley teaches a specific substrate material required in dependent claim 9 (e.g., a silicon substrate; column 12, lines 12-20) having a high reflection region on said substrate (i.e., the reflective mirror; column 12, lines 20-25), and because Tiefenthaler et al teach the it is believed Gourley teaches the specific materials having the required reflective properties of dependent claims 7-9, it is believed that the modification of the

device of Tiefenthaler et al with the substrate and layers of high- and low-refractive index materials of Gourley has the required reflective properties of instant claim 19.

It would therefore have been obvious to a person of ordinary skill in the art at the time the invention was made to have modified the DNA chip as taught by Tiefenthaler et al with the layered high reflection region of Gourley with a reasonable expectation of success. The ordinary artisan would have been motivated to make such a modification because said modification would have resulted in a high reflection region providing reflectivity to 99% or more on a micromachineable support as explicitly taught by Gourley (column 12, lines 15-31).

3. Claims 4-6 and 21-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tiefenthaler et al (U.S. Patent No. 4,815,843, issued 28 March 1989) in view of Gourley (U.S. Patent No. 5,793,485, issued 11 August 1998) as applied to claims 1 and 19 above, and further in view of Gelfand et al (U.S. Patent No. 6,346,379 B1, issued 12 February 2002).

Regarding claims 4-6 and 21, the chips of claims 1 and 19 are discussed above. Tiefenthaler et al teach a relationship between the refractive index and the thicknesses of the layers of the chip as a critical element in the detection of molecules on the device (column 2, line 40-column 3, line 3), as well as detection of fluorescent tracers (i.e., labels; column 1, lines 36-42). Gourley also teaches one-quarter wavelength thicknesses of the mirror layers (column 12, lines 20-25). Gourley also teaches layers having thicknesses of about 50 to 150 nanometers (column 12, lines 38-41), as well as fluorescent staining (i.e., labeling) of the detected biological analyte (column 2, lines 41-50). Neither Tiefenthaler et al nor Gourley specifically teach the instantly claimed thicknesses of $\lambda/4n$, wherein λ is the emission wavelength of a fluorescent dye on a target DNA and n is the refractive index of the layer material.

The range of approximately 70% to approximately 130% required by claim 5 is interpreted to be 100%; i.e., claims 4 and 5 are interpreted as having the same thickness.

The odd multiple of required by 6 is interpreted to be 1; i.e., claims 5 and 6 are interpreted as having the same thickness.

The emission wavelength of fluorescein isothiocyanate is 525 nanometers. The refractive indices of SiO2 and TiO2 are 1.45 and 2.3, respectively. Therefore, using the relationship of the thickness being equal to $\lambda/4n$ as required by claims 4-6, fluorescein isothiocyanate labeled nucleic acids would require thickness of 90.5 nanometers for an SiO2 layer and 57.1 nanometers for a TiO2 layer. The required thicknesses clearly lie within the range of about 50 to 150 nanometers as taught by Gourley.

Gelfand et al teach nucleic acids labeled with fluorescein family dyes (Abstract) have the added advantage of avoiding the need of additional processing steps after labeling (column 1, lines 58-65).

It is noted that the courts have stated:

similar properties may normally be presumed when compounds are very close in structure. Dillon, 919 F.2d at 693, 696, 16 USPQ2d at 1901, 1904. See also In re Grabiak, 769 F.2d 729, 731, 226 USPQ 870, 871 (Fed. Cir. 1985) ("When chemical compounds have very close' structural similarities and similar utilities, without more a prima facie case may be made."). Thus, evidence of similar properties or evidence of any useful properties disclosed in the prior art that would be expected to be shared by the claimed invention weighs in favor of a conclusion that the claimed invention would have been obvious. Dillon, 919 F.2d at 697-98, 16 USPQ2d at 1905; In re Wilder, 563 F.2d 457, 461, 195 USPQ 426, 430 (CCPA 1977); In re Linter, 458 F.2d 1013, 1016, 173 USPQ 560, 562 (CCPA 1972) (see MPEP 2144.08(d)).

Therefore, emission spectra of the fluorescein family dyes of Gelfand et al would be presumed to have similar properties to that of the example of fluorescein isothiocyanate.

It would therefore have been obvious to a person of ordinary skill in the art at the time the invention was claimed to have modified the chip comprising labeled targets of Tiefenthaler et al in view of Gourley with the fluorescein labels as taught by Gelfand et al with a reasonable expectation of success. The resulting modification would have resulted in a chip having layers with the required thicknesses of claims 4-6 as taught by Tiefenthaler et al in view of Gourley relative to the emission wavelength of the label as taught by Gelfand et al. The ordinary artisan would have been motivated to make such a modification because said modification would have resulted in labeled targets that avoid the need for additional processing steps after labeling as explicitly taught by Gelfand et al.

Regarding claim 22, Tiefenthaler et al teach a DNA chip comprising:

a substrate (e.g., substrate 2 of Figure 5, column 3, lines 30-35); a high reflection region comprising at least one film having a relatively high refractive index on a region of the substrate (e.g., Figure 5, where layer 1 has a higher refractive index than the adjacent media; [column 3, lines 47-47], and wherein layer 1 is on diffraction grating 4, which is reflective; column 4, lines 8-12);

a low reflection region having a second film of a relatively low refractive index positioned around the high reflection region on the substrate (e.g., protective layer 12 of Figure 5, which surrounds the grating region and is a SiO2 layer; column 8, lines 55-58).

Tiefenthaler et al do not explicitly teach that the low reflection region has a lower reflectance than the higher reflection region. It is noted that *In re Best* (195 USPQ 430) and *In re Fitzgerald* (205 USPQ 594) discuss the support of rejections wherein the prior art discloses subject matter which there is reason to believe inherently includes functions that are newly cited or is identical to a product instantly claimed. In such a situation the burden is shifted to the applicants to "prove that subject matter shown to be in the prior art does not posses characteristic relied on" (205 USPQ 594, second column, first full paragraph). Because Tiefenthaler et al teach specific film materials required in dependent claims 7-8 (e.g., a high refractive index film of titanium dioxide [column 3, lines 34-39], and a low refractive index film of silicon oxide [i.e., SiO2; column 8, lines 55-58], it is believed Tiefenthaler et al teach materials having the required reflective properties of instant claim 1.

In addition, while Tiefenthaler et al teach that the high reflection region comprises two or more layers stacked on top of each other (column 3, lines 34-39), and that the layers are the high refractive index film titanium dioxide or the low refractive index film silicon dioxide (column 3, lines 34-39), Tiefenthaler et al do not explicitly teach a layer of the low refractive index material stacked on a high refractive index film, nor do Tiefenthaler et al teach the high reflection regions has a higher reflectivity than the substrate.

However, Gourley teaches a biochip (e.g., a resonant-cavity apparatus for cytometry analysis; Title) comprising

a substrate (e.g., substrate 50 of Figure 3a [column 12, lines 1-2], which is a silicon; column 12, lines 12-20); column having a high reflection region (e.g., an analysis region comprising reflecting mirror 14 and gain medium 18, wherein part#52 is an activated portion of gain medium 18; Figure 3a and column 12, lines 20-45) comprising a first film of having a relatively low refractive index and a film having a relatively high refractive index stacked on a region of the substrate (e.g., the mirror and is formed from a plurality of alternating layers of high and low refractive index materials [column 12, lines 20-45], and wherein the gain medium is the high refractive index film) with the added advantages that the layered films provide reflectivity to 99% or more and that the silicon substrate is micromachineable (column 12, lines 15-31).

While Gourley does not explicitly teach the high reflection region has a higher reflectance than the substrate, it is noted above that the burden is shifted to the applicants to "prove that subject matter shown to be in the prior art does not posses characteristic relied on" (205 USPQ 594, second column, first full paragraph) when the prior art discloses subject matter which there is reason to believe inherently includes functions that are newly cited or is identical to a product instantly claimed. Because Gourley teach a specific substrate material required in dependent claim 9 (e.g., a silicon substrate; column 12, lines 12-20) having a high reflection region on said substrate (i.e., the reflective mirror; column 12, lines 20-25), and because Tiefenthaler et al teach the it is believed Gourley teaches the specific materials having the required reflective properties of dependent claims 7-9, it is believed that the modification of the device of Tiefenthaler et al with the substrate and layers of high- and low-refractive index materials of Gourley has the required reflective properties of instant claim 1.

It would therefore have been obvious to a person of ordinary skill in the art at the time the invention was made to have modified the DNA chip as taught by Tiefenthaler et al with the layered high reflection region of Gourley with a reasonable expectation of success. The ordinary artisan would have

been motivated to make such a modification because said modification would have resulted in a high reflection region providing reflectivity to 99% or more on a micromachineable support as explicitly taught by Gourley (column 12, lines 15-31).

Tiefenthaler et al teach a relationship between the refractive index and the thicknesses of the layers of the chip as a critical element in the detection of molecules on the device (column 2, line 40-column 3, line 3), as well as detection of fluorescent tracers (i.e., labels; column 1, lines 36-42). Gourley also teaches one-quarter wavelength thicknesses of the mirror layers (column 12, lines 20-25). Gourley also teaches layers having thicknesses of about 50 to 150 nanometers (column 12, lines 38-41), as well as fluorescent staining (i.e., labeling) of the detected biological analyte (column 2, lines 41-50). Neither Tiefenthaler et al nor Gourley specifically teach the instantly claimed thicknesses of $\lambda/4n$, wherein λ is the emission wavelength of a fluorescent dye on a target DNA and n is the refractive index of the layer material.

The range of approximately 70% to approximately 130% required by claim 22 is interpreted to be 100%.

The emission wavelength of fluorescein isothiocyanate is 525 nanometers. The refractive indices of SiO2 and TiO2 are 1.45 and 2.3, respectively. Therefore, using the relationship of the thickness being equal to $\lambda/4n$ as required by claims 4-6, fluorescein isothiocyanate labeled nucleic acids would require thickness of 90.5 nanometers for an SiO2 layer and 57.1 nanometers for a TiO2 layer. The required thicknesses clearly lie within the range of about 50 to 150 nanometers as taught by Gourley.

Gelfand et al teach nucleic acids labeled with fluorescein family dyes (Abstract) have the added advantage of avoiding the need of additional processing steps after labeling (column 1, lines 58-65).

It is noted that the courts have stated:

similar properties may normally be presumed when compounds are very close in structure. Dillon, 919 F.2d at 693, 696, 16 USPQ2d at 1901, 1904. See also In re Grabiak, 769 F.2d 729, 731, 226 USPQ 870, 871 (Fed. Cir. 1985) ("When chemical compounds have very close' structural similarities and similar utilities, without more a prima facie case may be made."). Thus, evidence of similar properties or evidence of any useful properties disclosed in the prior art that would be expected to be shared by the claimed invention

weighs in favor of a conclusion that the claimed invention would have been obvious. Dillon, 919 F.2d at 697-98, 16 USPQ2d at 1905; In re Wilder, 563 F.2d 457, 461, 195 USPQ 426, 430 (CCPA 1977); In re Linter, 458 F.2d 1013, 1016, 173 USPQ 560, 562 (CCPA 1972) (see MPEP 2144.08(d)).

Therefore, emission spectra of the fluorescein family dyes of Gelfand et al would be presumed to have similar properties to that of the example of fluorescein isothiocyanate.

It would therefore have been obvious to a person of ordinary skill in the art at the time the invention was claimed to have modified the chip comprising labeled targets of Tiefenthaler et al in view of Gourley with the fluorescein labels as taught by Gelfand et al with a reasonable expectation of success. The resulting modification would have resulted in a chip having layers with the required thicknesses of claims 4-6 as taught by Tiefenthaler et al in view of Gourley relative to the emission wavelength of the label as taught by Gelfand et al. The ordinary artisan would have been motivated to make such a modification because said modification would have resulted in labeled targets that avoid the need for additional processing steps after labeling as explicitly taught by Gelfand et al.

4. Claims 18 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tiefenthaler et al (U.S. Patent No. 4,815,843, issued 28 March 1989) in view of Gourley (U.S. Patent No. 5,793,485, issued 11 August 1998) as applied to claims 1, and 19 above, and as further evidenced by the CRC Handbook of Chemistry and Physics (87th edition, CRC Press, Boca Raton, FL, pages 12-116, 12-134, and 12-153 (2006-2007)).

Regarding claims 18 and 20, the chips of claims 1 and 19 are discussed above. While neither Tiefenthaler et al nor Gourley specifically teaches that the low reflection region has a lower reflectance than the substrate, it is noted above that the burden is shifted to the applicants to "prove that subject matter shown to be in the prior art does not posses characteristic relied on" (205 USPQ 594, second column, first full paragraph) when the prior art discloses subject matter which there is reason to believe inherently includes functions that are newly cited or is identical to a product instantly claimed. Because Gourley teaches a specific substrate material required in dependent claim 9 (e.g., a silicon substrate;

column 12, lines 12-20) having a high reflection region on said substrate (i.e., the reflective mirror; column 12, lines 20-25), and because Tiefenthaler et al teach the specific materials having the required reflective properties of dependent claims 7-9, it is believed that the modification of the device of Tiefenthaler et al with the substrate and layers of high- and low-refractive index materials of Gourley has the required reflective properties of instant claim 18.

In addition, the CRC Handbook of Chemistry and Physics defines the reflectivity of silicon at approximately 2.5E/eV (i.e., approximately 500 nm; page 12-116) as 0.39 (page 12-134) and the reflectivity of silicon dioxide at approximately 2.5 E/eV to be approximately 0.035 (page 12-153). Therefore, the modification of the chip of Tiefenthaler et al with the teaching of Gourley as outlined above would have resulted in the instantly claimed chips having a low reflection region of silicon dioxide having a lower reflection than that of the silicon substrate.

5. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tiefenthaler et al (U.S. Patent No. 4,815,843, issued 28 March 1989) in view of Gourley (U.S. Patent No. 5,793,485, issued 11 August 1998), and in view of Gelfand et al (U.S. Paten No. 6,346,379 B1, issued 12 February 2002) as applied to claim 22 above, and as further evidenced by the CRC Handbook of Chemistry and Physics (87th edition, CRC Press, Boca Raton, FL, pages 12-116, 12-134, and 12-153 (2006-2007)).

Regarding claims 18 and 20, the chips of claims 1 and 19 are discussed above. While neither Tiefenthaler et al, Gourley, not Gelfand et al specifically teaches that the low reflection region has a lower reflectance than the substrate, it is noted above that the burden is shifted to the applicants to "prove that subject matter shown to be in the prior art does not posses characteristic relied on" (205 USPQ 594, second column, first full paragraph) when the prior art discloses subject matter which there is reason to believe inherently includes functions that are newly cited or is identical to a product instantly claimed. Because Gourley teaches a specific substrate material required in dependent claim 9 (e.g., a silicon substrate; column 12, lines 12-20) having a high reflection region on said substrate (i.e., the reflective

mirror; column 12, lines 20-25), and because Tiefenthaler et al teach the specific materials having the required reflective properties of dependent claims 7-9, it is believed that the modification of the device of Tiefenthaler et al with the substrate and layers of high- and low-refractive index materials of Gourley has the required reflective properties of instant claim 18.

In addition, the CRC Handbook of Chemistry and Physics defines the reflectivity of silicon at approximately 2.5E/eV (i.e., approximately 500 nm; page 12-116) as 0.39 (page 12-134) and the reflectivity of silicon dioxide at approximately 2.5 E/eV to be approximately 0.035 (page 12-153). Therefore, the modification of the chip of Tiefenthaler et al with the teaching of Gourley as outlined above would have resulted in the instantly claimed chips having a low reflection region of silicon dioxide having a lower reflection than that of the silicon substrate.

6. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tiefenthaler et al (U.S. Patent No. 4,815,843, issued 28 March 1989) in view of Gourley (U.S. Patent No. 5,793,485, issued 11 August 1998) as applied to claim 1 above, and further in view of Motoda et al (U.S. Patent No. 5,872,022, issued 16 February 1999).

Regarding claim 17, the chip of claim 1 is discussed above. Neither Tiefenthaler et al nor Gourley teaches the second film has a thickness the same as a total thickness of a plurality of films.

However, Motoda et al teach a semiconductor substrate having multiple films (i.e., layers; Abstract and Figure 14(e)) wherein a thickness of a surrounding layer (e.g., combined layers 27a and 27b, which are made of the same material [column 17, lines 14-34] and are thus interpreted as acting as a single layer) is equal to the thickness of a plurality of layers which the surrounding layer surrounds (e.g., layer 27 surrounds and is the same thickness as layers 23-26; Figure 14(e)) with the added advantage that the layers are produced without the use of an etching solution, thereby preventing incorporation of impurities and keeping the surface clean (Abstract).

It would therefore have been obvious to a person of ordinary skill in the art at the time the invention was made to have modified the chip of Tiefenthaler et al in view of Gourley with the thicknesses as taught by Motoda et al with a reasonable expectation of success. The ordinary artisan would have been motivated to make such a modification because said modification would have resulted in films (i.e., layers) that are produced without the use of an etching solution, thereby preventing incorporation of impurities and keeping the surface clean as explicitly taught by Motoda et al (Abstract).

Conclusion

1. No claim is allowed.

2. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Robert T. Crow whose telephone number is (571) 272-1113. The examiner can normally be reached on Monday through Friday from 8:00 am to 4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ram Shukla can be reached on (571) 272-0735. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Robert T. Crow
Examiner
Art Unit 1634

JULIET C. SWITZER
PRIMARY EXAMINER